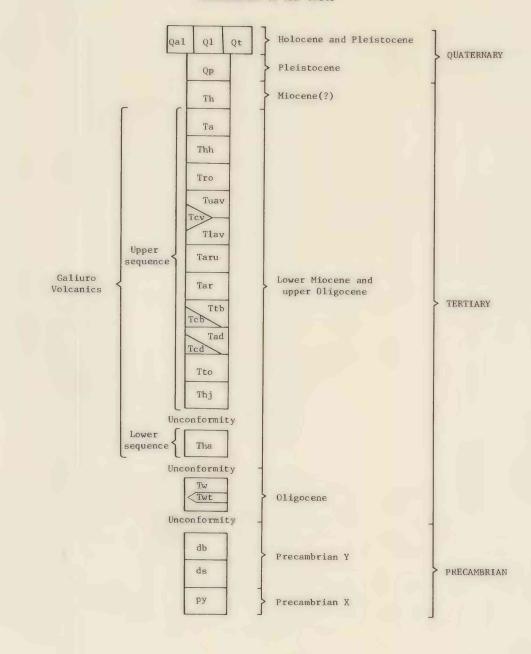
DEPARTMENT OF THE INTERIOR

GEOLOGIC MAP SHOWING SAMPLE AND EXPLORATION LOCALITIES IN THE ARAVAIPA CANYON INSTANT STUDY AREA, PINAL AND GRAHAM COUNTIES, ARIZONA

OPEN-FILE REPORT

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

- ALLUVIUM--Gravel, sand, and silt deposited along stream channels
- LANDSLIDE DEPOSITS--Jumbled angular blocks and finer material derived largely from upper unit of Hells Half Acre Tuff Member; reportedly caused by earthquake in 1880's
- TALUS DEPOSITS--Angular blocks to silt-sized particles below cliffs

interfingering contact with the Hells Half Acre Tuff Member

- SOIL AND GRAVEL VENEER--Gravel and sand in a fine-grained reddish matrix on pediment and terrace surfaces
- HELL HOLE CONGLOMERATE (maximum of nearly 200 m exposed, may be as much as 600 m thick) -- Light-colored moderate to well indurated rock composed of angular to rounded pebbles, cobbles and occasional boulders derived largely from the Galiuro Volcanics. Contains interbedded sandy material and a few thin white rhyolite tuff beds. No mineral deposits reported by Simons (1964, p. 100). The conglomerate forms massive cliffs along upper Aravaipa and lower Parsons Canyon and in Turkey and Deer Creeks. It is

separated from the Galiuro Volcanics by high-angle, east-facing normal faults or overlaps it

- The Galiuro Volcanics (maximum thickness about 280 m in study area) is composed of rhyolite and quartz latite ash-flow tuffs, rhyolite and andesite flows and tuffs, and conglomerate. It extends for about 15 km northwest of Aravaipa Canyon and 95 km southeast. The thickest section is to the southeast where the formation consists of an older and a younger sequence (Creasey and Krieger, 1978), separated by an erosional unconformity. Except for one exposure of one unit in the older sequence, only the younger sequence crops out in the Aravaipa Canyon area.
- APSEY CONGOLMERATE MEMBER (maximum thickness of 60 m)-- Cliff-forming, light-colored conglomerate and some conglomeratic tuff, composed of pebbles, cobbles and occasional boulders of rocks derived predominately from rhyolite-obsidian member but contain sparse to abundant older rocks in a well indurated sandy, mostly noncalcareous matrix, composed of quartz, feldspar, and many small rock and mineral fragments. Pumice shards and lapilli common in lower part. The conglomerate is the youngest member of the Galiuro Volcanics in the study area, but to the south, on and near Table Mountain and Holy Joe Peak, it is overlain by andesite that is included in the Galiuro Volcanics (Krieger, 1968a). Although Apsey Conglomerate Member rests on successively older members of the Galiuro Volcanics south of the study area, it is included in the Volcanics because of the overlying andesite and because of the gradational
- HELLS HALF ACRE TUFF MEMBER (Maximum thickness of about 150 m along Aravaipa Canyon, thinner elsewhere because lower units lap out against older rocks)—Composed of three units along Aravaipa Canyon.

 <u>Lower unit</u> (0 to at least 15 m thick), well-bedded cliff-forming porous, yellowish-brown to brown rhyolite tuff with pumice lapilli and grains of quartz, feldspar, and biotite in a matrix of shards. Deposited in water impounded behind tongues of the rhyolite-obsidian member. Middle unit (0-120 m, maximum thickness between Javalina and Cave Canyons), massive cliff-forming white to very pale pink tuff separated into two parts by narrow bench or slope. Composed of pumice lapilli, some obsidian and rhyolite lapilli, and grains of quartz, feldspar, and minor biotite in a matrix of shards. The middle unit, at least the lower part, is considered a nonwelded or slightly welded ash-flow tuff, because it is massive and unsorted and has poorly developed columnar joints. <u>Upper unit</u> (10 or more m), the most extensive unit, is a cliff- and slope-forming white to tan air-fall tuff and partly reworked lithic and vitric tuff containing large angular lapilli of lump pumice and rhyolite-obsidian. Cut by northeast- and northwest-trending joints along which narrow, deep crevices have developed, especially on Hells Half Acre
- RHYOLITE-OBSIDIAN MEMBER (0 to at least 150 m thick within study area)--Gray and black flow-banded to massive, perlitic to lithophysal obsidian and finely laminated to contorted gray stony (devitrified) locally lithophysal rhyolite flow and flow breccia; contains small sanidine, quartz, plagioclase, pyroxene, hornblende, magnetite, and sphene crystals and scattered accidental fragments in a glassy or devitrified groundmass. Member was extruded as domes and stubby flows, only a few reached the vicinity of Aravaipa Canyon and none of them reached the south side of what is now the canyon

ANDESITE AND CONGLOMERATE OF VIRGUS CANYON

- UPPER ANDESITE (0-30 m thick in western part of area, as much as 60 m in eastern part)--Dark-colored, dense, fine-grained locally amygdaloidal flow with small grains of plagioclase, feldspar, red altered olivine, and sparse clinopyroxene. Some flows have brecciated bases
- CONGLOMERATE (0-30 m thick, thickest exposures along Aravaipa Cnyon between Javalina and Booger Canyons) -- Pebbles and cobbles derived from lower andesite of Virgus Canyon and older rocks in a sandy matrix. Present locally east of Booger Canyon, but not mapped separately. Along Whitewash, Bear Springs, and lower Aravaipa Canyons 0-8 m of unmapped conglomerate composed largely of lower andesite of Virgus Canyon locally separates Aravaipa Member from Hells Half Acre Tuff Member

developed columnar jointing

Tlav LOWER ANDESITE (0-130 m thick, discontinuous in western part of study area)--Medium-gray to light brownish-gray and reddish-brown, very coarsely porphyritic ("turkey track") olivine andesite; minor amounts of porphyritic to aphanitic andesite. Platelike plagiclase as much as 2 cm long and 0.2 cm thick, small (mostly less than 1 mm) altered olivine and a little clinopyroxene in a groundmass of plagioclase laths, clinopyroxene, altered olivine, apatite, and magnetite or ilmenite. At and west of the mouth of Paisano Canyon the upper half of the lower andesite erodes to prominent cliffs showing well-

ARAVAIPA MEMBER

- Ash-flow tuff of rhyolite composition that is an exceptional example of an ash-flow with a well-developed interior zonation and a nonwelded distal margin. Interior part of member well-exposed in near-vertical cliffs along Aravaipa, Parsons, and east branch of Virgus Canyons. Nonwelded distal margin, now zeolitized, exposed between Bear Springs and Cave Canyons. Composed of pumice lapilli, crystal fragments (not abundant) of quartz, feldspar, and biotite, minor foreign rock and mineral fragments, in a shard matrix, and some rhyolite lapilli in upper part. (75-90 m thick, less than 15 m in
- Taru UPPER PARTLY WELDED ZONE (0-30 m thick) -- White, soft slope-forming unit with quartz and feldspar the principal devitrification and vapor-phase minerals. Top part, west of Parsons Canyon in the southern part of the study area, is more densely welded than underlying tuff; it probably represents another pulse of the ash flow, one that was hot enough to become more densely welded than underlying tuff. Type of crystallization, however, indicates that it is part of the same cooling unit as the rest of the Aravaipa
- WELDED ZONE (60-75 m thick)--Separated into the following zones (in descending order):

 <u>Columnar jointed zone</u>, cliff-forming, light brownish-gray, devitrified rock, mostly densely welded (welding increases downward). Groundmass consists of quartz, feldspar and some cristobalite; coarse-grained vapor-phase crystallization confined to pumice lapilli). Platy-jointed zone, densely welded devitrified tuff, with closely spaced subhorizontal joints; slightly darker color than columnar-jointed zone. <u>Vuggy zone</u>, densely welded and devitrified rock composed largely of cristobalite and feldspar, some quartz and altered biotite; abundant large somewhat flattened vugs or lithophysae, as much as 15 cm in diameter, lined with inward projecting acicular quartz and locally calcite crystals. A thin vuggy zone within the upper part of the overlying platy jointed zone suggests a second pulse of the ash low. Vitrophyre, grayish black to brown, densely welded, and glassy. Vitrophyrye is exposed along Parsons, east branch of Virgus Canyons, and in Aravaipa Canyon westward from easternmost exposures of the Precambrian porphyry. Basal tuff zone, very light brown, slightly welded in upper part to nearly white and nonwelded in lower part. Mostly vitric

TUFF AND CONGLOMERATE OF BEAR SPRINGS CANYON

- TUFF (0-25 m thick)--Rhyolite ash-flow tuff composed of shards, pumice lapilli, crystal and some accidental fragments, and small lithophysae. Lower part is pink tuff largely altered to clinoptilolite, upper part is light olive-gray to light brownish-gray, columnar-jointed tuff. The member is well exposed in the western and southeastern parts of the area
- CONGLOMERATE (0-15 m thick) -- Composed of older rocks, mostly Paleozoic rocks and older members of the Galiuro Volcanics; diabase common in basal part of conglomerate where it underlies the tuff of Bear Springs Canyon, below the tuff

ANDESITE AND CONGLOMERATE OF DEPRESSION CANYON

- ANDESITE (0-60 m thick, mostly less than 10 m, except in western part of study area)--Massive, flow-banded to agglomeratic, gray, brown, and olive andesite; local tuff and breccia beds at base and between flows. Vesicular, nonvesicular or amygdaloidal andesite with a few to abundant, small phenocrysts of plagioclase, olivine, altered or partly altered to iddingsite, pyroxene, and magnetite in a groundmass of plagioclase microlites, pyroxene, iddingsite, magnetite, and some K-feldspar
- Tcd CONGLOMERATE (0-15 m thick) composed of older rocks, including older members of the Galiuro Volcanics TUFF OF OAK SPRINGS CANYON (70 to 150 m thick in eastern part of study area, absent in western part, thin
 - (0-30 m) and discontinuous south of western part of study area). Thicker sections are composed of at least 3 rhyolite tuff units (12-30 m thick, total about 70 m), some of them may be of ash-flow origin, HOLY JOE MEMBER (0-10 m thick, thicker sections exposed south of study area)--Quartz-latite ash-flow tuff,
 - black and brown vitrophyre with abundant crystal fragments (quartz, plagioclase, biotite, sanidine), pumice lapilli, and foreign fragments in a firmly welded shard matrix. In study area, generally consists largely of vitrophyre overlain by 1-2 m of brown devitrified tuff beneath about a meter of vitrophyre at the top. Not encountered in drill hole west of Parsons Canyon where hornblende andesite of Parsons Canyon separates tuff of Oak Springs Canyon from underlying andesite of the lower sequence of the

HORNBLENDE ANDESITE OF PARSONS CANYON (Remnant of a hill at least 50 m high exposed in bottom of Parsons Holy Joe Members; now interpreted as probably the top of the lower sequence of the Galiuro Volcanics. Massive resistant, light brownish-gray porphyritic flow with well-developed mostly flat flow layering defined particularly by phenocrysts of hornblende. Hornblende phenocrysts as much as 5 mm long, millimeter-sized grains of feldspar, euhedral plagioclase phenocrysts 0.2-1 mm across; groundmass of plagioclase microlites, some interstitial devitrified glass and magnetite

WHITETAIL CONGLOMERATE

- CONGLOMERATE (0-90 m thick) -- Composed of pebbles and cobbles of Precambrian rocks, largely porphyry, diabase, and some Paleozoic formations; well indurated
- TUFF (0-8 m thick)--White bed of rhyolite tuff in Whitetail Conglomerate

PRECAMBRIAN

- DIABASE (0-250 m thick)--Dark-gray to dark greenish-gray or olive-gray, medium-grained diabase, intruded as sills and multiple sills in older Precambrian rocks. Composed of plagioclase, pyroxene, magnetite, ilmenite, and minor olivine; texture is diabasic, ophitic or poikilitic
- DRIPPING SPRING QUARTZITE (less than 10 m thick)--Small lenses in diabase sills in southwestern part of study area, feldspathic to arkosic quartzite
- PORPHYRY (more than 100 m exposed along Aravaipa Canyon)--Massive to foliated, fine-grained porphyritic rock in shades of red, brown and gray. Sparse to abundant phenocrysts of quartz and plagicclase (1 mm to 3 mm) and scattered lithic fragments (20 m long or more) in a dense groundmass of quartz, alkalic feldspar, and variable amount of sericite, some epidote, biotite, magnetite, and chlorite. Part of map unit may have been of ash-flow tuff origin; part may include some granitic intrusive rocks. Forms massive cliffs in western part of Aravaipa Canyon and upper Cave Canyon. Locally cut by minute quartz veins or by larger gash or ladderlike veins of milky quartz

- --- Fault--long dashed where approximately located, dotted where concealed
- Axis of anticline, dotted where concealed
- Axis of syncline, dotted where concealed
- Strike and dip of beds
- Horizontal beds
- Strike and dip of foliation
- ⊙35 U.S. Geological Survey sample
- U.S. Bureau of Mines sample
- Drill hole